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The life of a fish

Aquaculture Department, Southeast Asian Fisheries Development Center

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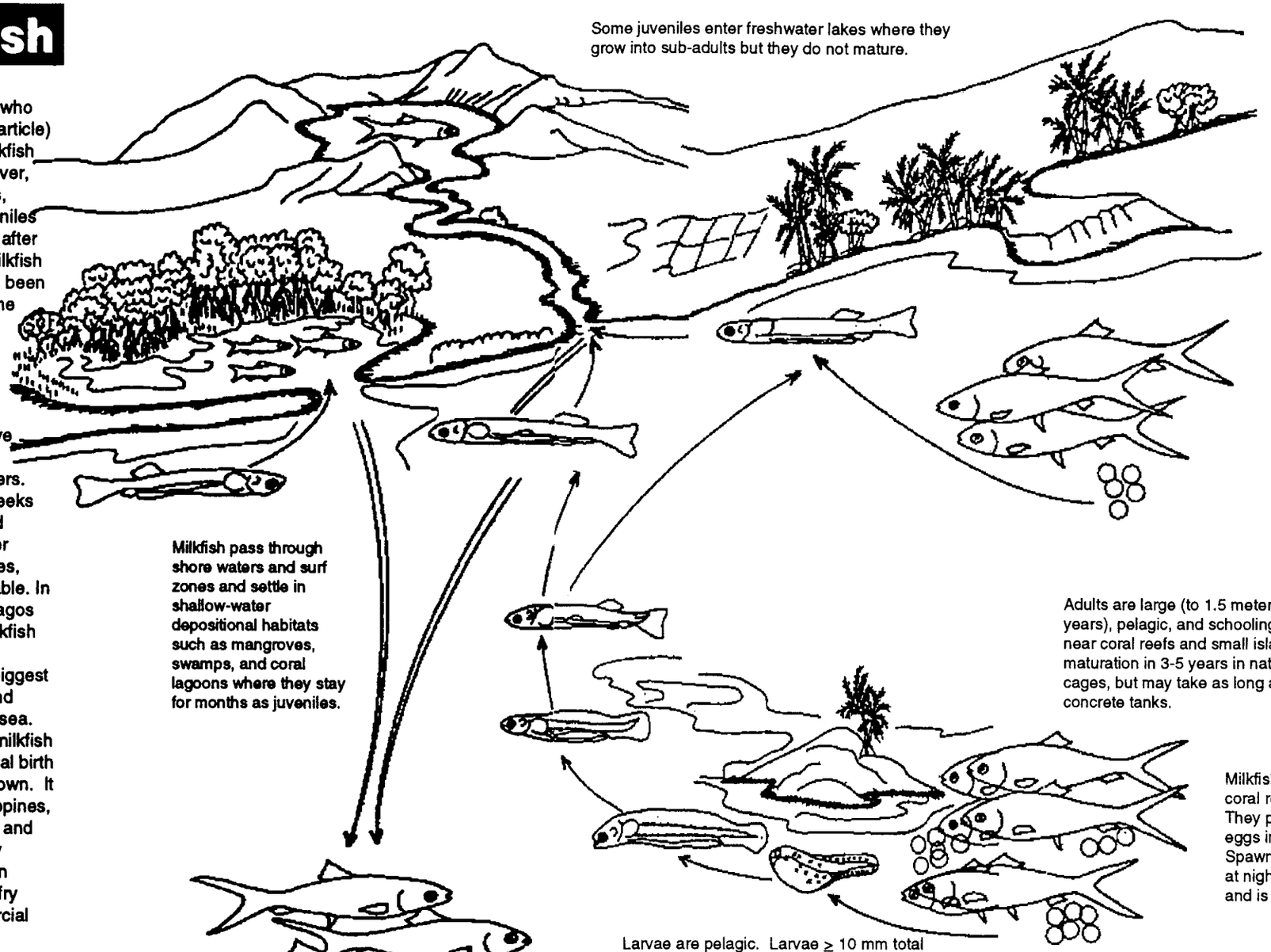
SEAFDEC scientist Teodora Bagarinao -- who had studied and collated information (this article) on milkfish in the wild -- notes that the milkfish life history is a series of migrations. However, little is known about the actual movements, particularly during the period after the juveniles leave the nursery grounds, and the period after the spawning of adults in nature. Since milkfish larvae are used in aquaculture, there have been attempts to link the spawning grounds to the inshore collection grounds, that is, to find the mechanism for the appearance of milkfish fry en masse in shore waters. No one has really been successful. Available evidence, Dr. Bagarinao says, indicates that milkfish larvae move by active migration and passive transport from offshore spawning grounds into shore waters. Then they enter and settle in mangrove creeks and swamps, coral lagoons, estuaries, and sometimes freshwater lakes. Shallow-water habitats appear to be obligatory for juveniles, while freshwater habitats are used if available. In the Philippines and other oceanic archipelagos where freshwater bodies are few, most milkfish probably never see freshwater.

Much remains to be studied. The biggest gaps are in milkfish ecology, physiology and behavior, including the migration habits at sea. Stock assessment has not been done for milkfish anywhere, and population dynamics, natural birth rates and mortality rates are virtually unknown. It is difficult to study wild milkfish in the Philippines, says Dr. Bagarinao, because the juveniles and adults are not fished in quantity -- probably because inshore larvae are. The effects on milkfish population genetics of the current fry fishery, the production of larvae in commercial hatcheries, and searanching of hatchery-produced larvae will need to be monitored. There must be a strong effort to protect coastal habitats so that aquaculturists and consumers may continue to benefit from milkfish.

Literature citations are given in full in the book **Biology of Milkfish *Chanos chanos* Forsskal** published by SEAFDEC/AQD in 1991 and in the review paper by Dr. Bagarinao on *Systematics, distribution, genetics, and natural life history of milkfish* in the journal **Environmental Biology of Fishes** 39:23-41 (1994).

A summary of the natural life history of milkfish (similar to this one) appeared in **SEAFDEC Asian Aquaculture** Vol. XVI No. 3 September 1994.



Some juveniles enter freshwater lakes where they grow into sub-adults but they do not mature.

Milkfish eat a variety of food, most commonly: cyanobacteria, diatoms, detritus along with invertebrates such as small crustaceans and worms. Adults apparently swim through plankton masses and larval schools -- they have been found with juvenile sardines in the gut and they ingest their own eggs after spawning (in floating cages).

Milkfish pass through shore waters and surf zones and settle in shallow-water depositional habitats such as mangroves, swamps, and coral lagoons where they stay for months as juveniles.

Adults are large (to 1.5 meter or 15 kg), long-lived (to 18 years), pelagic, and schooling. They spawn offshore near coral reefs and small islands. Adults reach sexual maturation in 3-5 years in nature and in large floating cages, but may take as long as 8-10 years in ponds and concrete tanks.

Milkfish spawn offshore near coral reefs or small islands. They produce 0.5-6.0 million eggs in 3-13 kg females. Spawning takes place usually at night, may be lunar periodic, and is strongly seasonal.

Both juveniles and sub-adults go back to sea when they reach the size limit supportable by inland habitats. Little is known of milkfish at sea before they reach sexual maturity at about five years and after their spawning migrations along the coasts.

Larvae are pelagic. Larvae ≥ 10 mm total length and 2-3 weeks old (commonly called fry) move inshore by both passive advection and active migration. Milkfish fry or seed (to the aquaculturist) are larvae approaching metamorphosis and the end of pelagic interval. Those caught in the Philippines, Taiwan, Japan and elsewhere are all 10-17 mm total length, 14-29 days old (average 13-14 mm, 20 days). A fishery on inshore milkfish larvae supports the centuries-old grow-out culture industry.

Fertilized eggs are pelagic, spherical and 1.1-1.25 mm in diameter. Embryonic development is typical of bony fishes and takes 20-35 hours at temperatures of 26-32°C and salinities of 29-34 ppt. Researchers at SEAFDEC/AQD collected 1,700 milkfish eggs in 188 successful (1,898 total) plankton tows around Panay Island in 1976-1980, most abundantly near the surface but also in low numbers down to 30-50 meters deep.